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AN EXPERIMENTAL STUDY OF KINAESTHETIC IMAGERY¹

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	PAGE
Introduction.....	54
I. Kinaesthetic Sensation and Kinaesthetic Image Compared.....	55
Experiment I. Preliminary.....	55
Experiment II.....	56
(1) Quality.....	58
(2) Intensity.....	60
(3) Extent.....	61
(4) Duration.....	62
(5) Vividness.....	62
(6) Locality.....	63
(7) Pattern.....	65
(8) Temporal Course.....	66
(9) "Body" or Collocation of Attributes.....	66
Summary.....	67
II. Resident and Projected Kinaesthetic Imagery.....	68
Experiment III. Preliminary.....	69
Experiment IV.....	69
A. Resident and Projected Kinaesthetic Imagery Compared....	72
(1) Quality.....	72
(2) Intensity.....	73
(3) Extent.....	74
(4) Duration.....	74
(5) Vividness.....	75
(6) Locality.....	76
(7) Pattern.....	77
(8) Temporal Course.....	77
Summary.....	78
B. Some Conditions of Resident and Projected Kinaesthetic Imagery.....	78
Conclusion.....	80

INTRODUCTION

In the first part of this paper we seek to determine the differences between sensory and imaginal kinaesthesia. It is often said that the kinaesthetic sensation and the kinaesthetic image are difficult or impossible to distinguish. We have attacked the problem by way of simple kinaesthetic complexes, experienced in their sensory reality and reproduced in imaginal terms. The results of this comparative study, attributive (sensational) and perceptive, are set forth on p. 67.

¹ From the Psychological Laboratory of Cornell University.

In the second part of the paper we have compared resident kinaesthesia with the projected kinaesthesia of the empathic experience. The results appear on page 78.

I. KINAESTHETIC SENSATION AND KINAESTHETIC IMAGE COMPARED

We wished to obtain, for the purpose of comparison, a psychological picture of sensory and imaginal kinaesthesia, first in attributive and then in perceptive terms. We made out 50 short commands to be read to the *O*'s. We paired these commands for sensation and image thus: (1) "Think of: nodding your head once." (2) "Nod your head once." (3) "Raise your index finger once." (4) "Think of: raising your index finger once." In order that the *O* should not know when to expect a sensory or an imaginal stimulus, we arranged the experiments by this schema: IS IS IS SI SI II SS IS IS IS.²

O sat in a dark room, facing a black wall. *E* sat at a table a few feet behind *O*, and near a window through which a streak of light, just sufficient for his needs, was allowed to shine.³ After *O* had read the instructions, *E* asked him to close his eyes. After a few minutes of rest, to free the eyes of *O* from possible images, *E* said "Ready," waited an instant, and read the stimulus-sentence. As he spoke the last word of the sentence, which was always "once," *E* started a stopwatch. When *O* said "Yes," indicating that the command had been obeyed, the watch was stopped.⁴ Then the complete report of *O* was taken down. An interval of 15 sec. then elapsed before the giving of the next stimulus-sentence.

We began the experiments in May, 1919, and carried them on during the following months of June (with the exception of a two weeks' vacation), July, August, and October. There were seven *O*'s: Dr. L. B. Hoisington, instructor in psychology; Drs. H. G. Bishop and M. J. Zigler, assistants in psychology; Mr. P. J. Cavanaugh, Misses C. Comstock, R. Stutsman, and A. H. Sullivan, all graduate students in psychology.⁵

Experiment I.

We performed preliminary experiments, in order to try out our 50 paired commands, and to give our *O*'s practice in describing their processes. We noticed very soon that, in the

² I = Image; S = Sensation.

³ A small shaded light was used for evening experimentation.

⁴ We have not included the times in the following results, because we found no typical times for sensation and image, the time for the carrying out of the sensory and imaginal commands being approximately the same.

⁵ St observed only during the summer term and did not complete the perceptive experiments. When the writer (Su) acted as observer, the experimenter (Ca, and later Miss M. F. Martin) made out new sets of stimulus-sentences.

pairs designated in the schema as SI, all *O*'s showed a tendency to be influenced in the imaginal part of the experiment by the report made upon the preceding sensory complex. The finding of attributive characters in the sensory complex suggested that the same attributes would appear in the image. An effort on *O*'s part not to be thus biased resulted often in a complete inhibition of imagery.

Experiment II

In the light of these preliminary experiments, we settled upon the 15 paired commands which seemed simplest and yet were adequate for our needs. We also separated and distributed the sensory and imaginal members of the pairs, so that the schema SI SI SI etc. still held good, except that the imaginal member of a given pair preceded the sensory by a number of sentences.

The instructions read: "You are to follow the instructions which I shall give you and to report the experiences thus set up with especial reference to kinaesthesia.

"Every kinaesthetic experience may show perceptive characters (locality, pattern, etc.) and attributive characters (quality, intensity, etc.). In the present series I wish you to report the experience in terms of quality, intensity, and extent.

"You may neglect every other character of the kinaesthetic experience, and you may neglect all non-kinaesthetic experiences aroused by the presented stimuli.

"If, however, you find yourself noting any further feature of the experimental consciousness, I shall be glad if you will report it."

It was necessary to fractionate the experiences for report. In Group I we asked for quality, intensity, and extent; in Group II, for intensity, extent and duration; in Group III, for extent, duration, and vividness; in Group IV, for duration, vividness, and locality; in Group V, for vividness, locality, and temporal course; in Group VI, for locality, pattern, and course; in Group VII, for quality, pattern, and course. In this way we covered the attributive and perceptive characters a number of times, using always the same 30 stimulus-sentences. We took one practice-series with every new group, in order that our *O*'s might attain a fair degree of stability of attitude.

Stability of attitude was not attained at once. All *O*'s with the exception of Su were more familiar with visual imagery than with kinaesthetic. Visual images came constantly at first, and acted as a distraction. After training in the observation of kinaesthetic processes, much of the visual imagery dropped into the background, and the kinaesthetic processes were sufficient to carry the whole meaning of an imagined movement. Then the *O*'s showed more certainty about their kinaesthetic imagery. After training, the *O*'s were able also to describe more accurately the kinaesthetic sensory processes.

Sources of error due to wrong attitudes had also to be discovered and eliminated. Some *O*'s fell into the habit of holding or building

up the image, instead of letting it run its course naturally, as they did in the case of sensations. We had to make it clear to them that such "holding" was possible only by a shift of attitude.

Another source of error was that of using a different scale for sensation and image in reports upon the intensive attributes. We explained that the intensive characters mean distances from zero, and that the same scale could therefore be used in both cases.

Results

We found that, whereas the actual perception of movement aroused by our stimuli was very complex, having a number of different sensations whose attributes had to be reported upon separately, the image of the movement was in some cases for all O's, and in most cases for a few O's, actually a single image-process of one quality, intensity, etc., which carried the whole meaning of movement. An actual nod, *e.g.*, aroused several sensations; the thought of nodding aroused, in many instances, one simple image. In other cases, the attributive reports seemed to indicate a single image-process, but the perceptive reports which came later showed that the apparently simple process was in reality an imaginal complex, with a pattern and temporal course, which the attributive *Aufgabe* did not always bring to light.

We have tabulated our results in parallel columns for sensation and image.⁶ There was no mention of the terms *image* and *sensation* in the instructions; and yet our stimuli were cut closely enough so that all O's reported, with as much assurance as they would show in reporting upon visual sensations and images, "I observed a kinaesthetic image," or "I experienced kinaesthetic sensations." If the O's indicated any doubt whether a slight movement had been made in the carrying out of an imaginal command, we threw out the results. The columns for sensation, then, represent reports of the experiences aroused by our sensory commands, but at the same time they represent the experiences which were introspectively recognized as sensory; while the columns for image represent reports of the experiences aroused by our imaginal commands, but only those experiences which were recognized introspectively as imaginal.

⁶ In the tables, the figures within the columns show the frequencies of report for the rubrics which head the horizontal columns. If, *e.g.*, the number after O's initial is 3, this means that the 30 stimulus-sentences were repeated 3 times for report upon the character in question; 45 experiments for sensation and 45 for image were performed.

(1) *Quality*

TABLE I

QUALITY

	B (3)		Ca (3)		Co (3)		H (3)		St (1)		Su (3)		Z (3)		Total	
	S	I	S	I	S	I	S	I	S	I	S	I	S	I	S	I
Du. P.	49	40	26	29	18	33	17		19	11	17	9	53	34	199	157
Br. P.							35						6		41	
Drag.							6						2		8	
Sm. P.	10	3	23	3	19	2	34		16	9	31		24	8	157	25
Strain.	28		28		35		38		9		20		31		189	
Ache.	15		9		5		11				9		1		50	
Lt. P.	12	5	11	29	6	13	9	47			20	38	17		75	132
Total.	114	48	97	62	83	48	150	47	44	20	97	47	134	42	719	314

Du. P. = Dull Pressure; Br. P. = Bright Pressure; Sm. P. = Smooth Pressure; Lt. P. = Light Pressure (or Neutral Pressure.)

Ca reported also strain in the image once in the early part of the experiment. Z reported 3 cases of strain and 3 of bright pressure in the images. The following were also reported in early observations: sharp pressure, Z, for image 2, for sensation 4; granular pressure, Z, for image 1, for sensation 1; coolness, Co, for sensation 2; St, for image 1; dizziness (which later was found to be nothing but dull pressure), for sensation, Ca 5; St, 1; Su, 3; for image Su, 2.

We see that the characteristic qualities in kinaesthetic sensations are dull pressure, light pressure, smooth pressure, strain, and ache. These were reported by all *O*'s except St, who reported no light pressure. Dull pressure averages the highest frequency, although the individual reports show that Ca, Co, and H reported the greatest number under strain, and Su the greatest number under smooth pressure. H and Z reported also bright pressure and drag. Bright pressure is experienced only when the *O* is in very good physical condition. Drag is very like dull pressure, and may have been considered qualitatively the same by the other five *O*'s.

The table shows very strikingly the fact that the image is less varied in quality than the corresponding sensations. The headings for quality run thus:

<i>Observer</i>	<i>Sensation</i>	<i>Image</i>
B	5	3
Ca	5	3
Co	5	3
H	7	1
St	3	2
Su	5	2
Z	7	3

In every case a greater number of qualities belongs to sensation.

Table I shows also the complexity of a perception of movement as compared with the imaginal reproduction of that movement. All the *O*'s except St performed 45 sensory experiments and 45 imaginal experiments on quality. The numbers in the total at the bottom of the table show that the different *O*'s reported from 83 to 150 separate qualities in the 45 sensory experiments, while they reported from 42

to 62 separate qualities in the 45 imaginal experiments. When we remember that 45 is the lowest number possible if we have one image for every experiment, it becomes evident that in most cases one image carried the whole meaning of the movement, provided that we take one quality to mean a simple process.⁷

TABLE II
INTENSITY

	B (2)		Ca (4)		Co (4)		H (2)		St (2)		Su (3)		Z (3)		Total	
	S	I	S	I	S	I	S	I	S	I	S	I	S	I	S	I
Strong.....	20		16		16		7		24		15		17		115	
M. St.....	22		5		3		17		6				21	7	74	7
Mod.....	11	7	63	40	58	27	22	5	31	4	28	10	20	18	233	106
M. Wk.....	8	16					10	1				3	14	16	28	45
Weak.....	13	14	48	45	33	23	25	16	11	12	39	21	6	2	175	133
V. Wk.....			3	6	3	22	5	3		18		11		3	9	65
Total.....	74	37	135	91	113	72	76	31	76	34	82	45	78	46	634	426

M. St. = Moderately Strong; Mod. = Moderate; M. Wk. = Moderately Weak
V. Wk. = Very Weak.

The following were reported in the early part of the experiments, and were not reported in later observations: kinaesthetic image, strong in intensity, Ca, 1; Co, 7; Z, 2; moderately strong, St, 1; moderate, H, 1; kinaesthetic sensation, very weak in intensity, H, 2; Su, 1; Z, 1.

All the O's but H reported dull pressure for the image; all but St and Z, light pressure; all but H and Su, smooth pressure. The smooth pressure has so low a frequency as compared with the other two qualities that we must doubt its validity as a separate quality for the image (cf. p. 73). We may be fairly certain, then, that the characteristic qualities in kinaesthetic imagery are dull pressure and light pressure; we may say without any doubt that all qualities in the image are "pressury" (a term used by O's in describing the quality of images).

⁷ For some observers (H and generally Z) one quality was to all intents and purposes a simple process, but for others it was not. We must not be misled by quality, for even though there is but one quality present, we have no guarantee that the image is not complex. There are still possible variations of intensity and vividness, as well as changes in temporal course. We found, indeed, that quality often-times played a surprisingly minor rôle in kinaesthetic experiences. Quality is usually regarded as the individualizing attribute; but our O's were often able to describe the intensive attributes of a sensation or image when they could not describe its quality. Furthermore, the quality of the kinaesthetic images was monotonous in its sameness, and yet the image was varied and interesting because of slight shadings of intensity, or slight changes during its brief temporal course.

The table shows only 42 imaginal qualities reported by Z in 45 experiments. In reality he reported 51 qualities, but the other 9 are included in a footnote to the table, because they are not qualities reported by other O's and were reported by Z only in early experiments.

There is neither strain nor ache in the image, though the kinaesthetic image may mean a movement that would be strainful or achy in sensation.

There were indications that there is a difference in brightness in the qualities of sensation and image. All qualities in the sensations seem to have a certain "liveness" or brightness which the qualities in the images lack. H stated the difference thus: "The quality of the image is dead and static, while the quality of the sensation 'wells up,' has brightness or liveness or sparkle, and is dynamic." There is, of course, always the possibility that an obscure perceptual motive has colored the sensations.

(2) *Intensity*

We find that the intensity of kinaesthetic sensations ranges from strong to weak. The whole intensive scale is represented in all the reports, save that three *O*'s report a few sensations of very weak intensity, while four report none below weak.

The highest frequency of report for B and Z occurred under the rubric "moderately strong;" for Co, Ca, and St under "moderate;" and for H and Su under "weak." Thus, the middle portion of the scale was most favored.

The kinaesthetic image has less range over the intensive scale than the sensation, going only from "moderate" to "very weak." There is one exception to this statement: Z reported 7 images as "moderately strong." Z showed a tendency to estimate all the intensive attributes high. This may have been due to the fact that he "held" his images at first; for the tendency disappeared in the later experiments.

The highest frequency for B's images was in the "moderately weak" group; the highest frequency for Ca's, H's, and Su's images was in the "weak" group; the highest frequency for Co's and Z's was in the "moderate" group. For all observers except Z more than half of all the images reported belong to the lower half of the scale. If we consider the totals at the left of the table, we see that the highest frequency for sensation fell under the "moderate" group, and for image, under the "weak" group.⁸

We may not say, then, that kinaesthetic images are weaker in intensity than kinaesthetic sensations, for some kinaesthetic sensations are weak; but we may say that kinaesthetic images are never strong in intensity, as kinaesthetic sensations often are.⁹

⁸ We cannot expect the individual reports to agree absolutely, for our *O*'s were using subjective scales. The small divergences from the average for the group show, however, that these scales must have been very much alike in all cases. In general, it is not the absolute estimate that we care for, but the relative judgments which show the difference between sensation and image.

We do not have agreement of numbers in the grand totals in the different tables. The characters for report were fractionated, and were repeated a different number of times.

⁹ The *O*'s, with further training, confined their reports on intensity of images more and more to the lower part of the intensive scale (cf. p. 73).

(3) *Extent*

TABLE III

EXTENT

	B (2)		Ca (5)		Co (4)		H (2)		St (2)		Su (5)		Z (6)		Total	
	S	I	S	I	S	I	S	I	S	I	S	I	S	I	S	I
V. Ex.	12		2		8		13				4				39	
Ext.	14		40	13	40		18		10		41		74	12	237	25
M. Ex.	10	2	19	11			7		11	2	29		15	4	91	19
Mod.		4			34	15	6		9	10		3	54	36	103	68
M. Lm.	6	7	8	5	6	8	5	2			17	22	1	2	44	46
Lim.	8	9	35	31	1	36	5	19	5	14	37	37	35	33	121	179
V. Lm.	6	13		2				12	6	5		15	6	15	18	67
Total.	56	35	104	62	89	64	49	33	42	31	128	77	185	102	653	404

V. Ex. = Very Extended; Ext. = Extended; M. Ex. = Moderately Extended; Mod. = Moderate; M. Lm. = Moderately Limited; Lim. = Limited; V. Lm. = Very Limited.

The following were also reported; kinaesthetic image, very extended, Ca, 2; Co, 1; extended, Co, 2; St, 1; kinaesthetic sensation, very limited in extent, Ca, 2. All of these reports occurred in the early part of the experiments.

The extent of kinaesthetic sensations ranges from very extended to very limited. All *O*'s but one favored the rubric "extended" the exception being St who favored "moderately extended." Twice as many sensations are found in the upper portion of the scale as in the lower.

The extent of the kinaesthetic image varies within smaller range than that of kinaesthetic sensations. To be sure, the table shows that two *O*'s reported a number of their images as "extended." It was in this group of experiments, however, that we discovered the same *O*'s "holding" their images. After we had instructed them that there must be no voluntary holding or building up of the image, the reports of "extended" dropped out almost entirely. In spite of this source of error, we see that by far the greatest number of images fall in the lower part of the extensive scale, and that no images reach the maximum of extent attained by some sensations.

Most of the images reported by B were "very limited;" most of those reported by Ca, Co, H, St, and Su were "limited;" while most of those reported by Z were "moderate." When all the sensations reported by all the *O*'s are totalled, the highest frequency falls under the rubric "extended;" when all the images reported are totalled, the highest frequency falls under the rubric "limited."

We may say, then, that kinaesthetic sensations tend to be extended, while kinaesthetic images tend to be rather limited. We may say also that whereas kinaesthetic sensations are sometimes limited in extent, kinaesthetic images are never maximally extended.¹⁰

¹⁰ The *O*'s, with further training, agree more and more in their reports upon the extent of the image (cf. p. 74).

(4) *Duration*TABLE IV
DURATION

	B (2)		Ca (5)		Co (5)		H (3)		St (2)		Su (5)		Z (5)		Total	
	S	I	S	I	S	I	S	I	S	I	S	I	S	I	S	I
Long.....	15		25	35	30		32		15		31		74	14	222	49
M. Lg.....	11		39	27	71	20	12				47		8		192	47
Mod.....	12	10					2	2	15	6		3	24	5	53	26
M. Sh.....	14	6	58	8	6	19	2	2		3	17	13	16	12	113	63
Short.....		15		28	5	26	12	34	7	6	34	46	16	27	78	182
V. Sh.....			4	2		9		8	3	11		13	5	15	12	58
Total.....	56	31	126	100	112	74	60	46	44	26	129	75	143	73	670	429

M. Lg. = Moderately Long; Mod. = Moderate; M. Sh. = Moderately Short; V. Sh. = Very Short.

The following reports occurred in the earlier experiments, and dropped out entirely in later experiments: kinaesthetic image, long in duration, Co, 2; H, 1; St, 2; moderately long, H, 1; Z, 1.

The duration of kinaesthetic sensation may be long, medium, or short. The sensations, however, tend to group themselves about the upper half of the scale, more than 50 per cent of all the sensations reported being above moderate.

The highest frequency fell under the heading "long" for B, H, and Z; under "moderately long" for Co and Su.

The kinaesthetic image, according to the table, may be anywhere from "moderately long" to "very short" in duration. This statement excludes the reports of Ca and Z, who in the first 3 repetitions of this group of experiments, "held" their images. After the instruction to let the image run its course naturally, the reports of "long" dropped out. For all O's but Ca, more than half of all the images reported are in the lower part of the scale.¹¹

As to highest frequencies, we find the greatest frequency occurring under the rubric "short" for all O's except Ca. In the totals, the highest frequency is under "long" for sensation, and under "short" for image.

(5) *Vividness*TABLE V
VIVIDNESS

	B (2)		Ca (3)		Co (3)		H (3)		St (1)		Su (3)		Z (3)		Total	
	S	I	S	I	S	I	S	I	S	I	S	I	S	I	S	I
V. H.....					5	6	2	3			2	9			9	18
High.....	29	10	8	15	18	23	43	35	24	10	16	24	27	24	165	141
M. H.....	13	16	17	10	12	1	6	1	3	9	13	6	12	16	76	59
Mod.....	9	15	12	18	21	5	5	3	6	5	17	5	29	8	99	59
M. Low.....	14	2	23	4			9				2		24	3	72	9
Low.....	13	2	25	5	14	10	21	4	3	3	21		15	4	112	28
Total.....	78	45	85	52	70	45	86	46	36	27	71	44	107	55	533	315

V. H. = Very High; M. H. = Moderately High; Mod. = Moderate; M. Low = Moderately Low.

In an early experiment, Su reported one case in which an image was of a low degree of vividness.

¹¹ With further training the O's confined their reports entirely to the lower part of the durative scale (cf. p. 75).

We find that the vividness of kinæsthetic sensations ranges from high to low. The sensations generally share their vividness with other members of the sensory complex, and are, therefore, not of the highest degree of vividness. The sensations in a perception of movement reach the highest degree of vividness only when they demand attention because of their quality (ache or strain), or their high intensity.

Most of the sensations reported by B, H, and St were "high" in vividness; most of those reported by Co and Z were "moderate," and most of those reported by Ca and Su were "low." For Ca, Co, Su, and Z there is a pretty even distribution between the three rubrics of "high," "moderate," and "low."

The kinaesthetic image makes up in vividness what it lacks in the other attributes. Comparatively few images were reported "low" in vividness. In nearly all these cases, the lack of vividness was due to the occurrence of a visual image along with the kinaesthetic image. Co had more images of a low degree of vividness than any other *O*; she always reported, in such instances, "The kinaesthetic image was complicated by a visual image." Ca and B had also visual accompaniments to their kinaesthetic imagery, in which cases the vividness of the kinaesthesia varied from "moderate" to "low."¹²

The highest frequency occurred under the heading "high" for Co, H, St, Z, and Su; under "moderately high" for B; under "moderate" for Ca. When all the sensations reported are totalled, the highest frequency comes under the rubric "high," just as the total for all images shows as highest frequency the rubric "high."

The kinaesthetic image, then, is of a high degree of vividness. It has the advantage over sensation in its simplicity and uniformity; it has a chance to stand alone in consciousness for a brief time. While kinaesthetic sensations may be as often low in vividness as high, kinæsthetic images, unmixed with imagery from other sense departments, are never low.

(6) Locality

TABLE VI
LOCALITY

	B (2)		Ca (3)		Co (3)		H (3)		Su (4)		Z (4)		Total	
	S	I	S	I	S	I	S	I	S	I	S	I	S	I
Deep.....	25	10	50	7	9	3	56		77	30	83	18	300	68
M. Deep.....	7	5	18	10	57	12	21		11	2	41	33	155	62
M. Sup.....	12	3	8	10		2	46		9	4	2	1	77	20
Sup.....	16	14	6	28	16	29	5	45	30	2	55	25	128	143
Total.....	60	32	82	55	82	46	128	45	127	38	181	77	660	293
Def.....	23	16	41	34	10	29	13	35	54	13	61	8	202	135
M. Def.....	11	4	22	10	43	10	42	8	18	12	53	35	189	79
Indef.....	22	18	15	4	28	8	47		45	13	66	32	223	75
Total.....	56	38	78	48	81	47	102	43	117	38	180	75	614	289

M. Deep = Moderately Deep; M. Sup. = Moderately Superficial; Sup. = Superficial; Def. = Definite; M. Def. = Moderately Definite; Indef. = Indefinite. B reported 9 images which were localised "outside;" Su reported 19 images as "not localised."

¹² Where the visual image acted as a distraction, it perhaps would have been better to count the experiment unsuccessful. We have not done this, for the disturbance seemed to affect only the reports on vividness. We have, therefore, included everything reported by all our *O*'s.

The depth of kinaesthetic sensation seems to be correlated with its quality. Dull pressure is deep or moderately deep; smooth pressure is deep or moderately deep; strain is more superficial; light pressure is superficial. The highest frequency of report for all *O*'s except Co was "deep;" the highest frequency for Co was "moderately deep."

The superficially localised sensations are, as a rule, definite in localisation; the deep sensations are sometimes quite definite, at other times indefinite. The highest frequency of report fell under the heading "definite" for B, Ca, and Su; under the heading "moderately definite" for Co; and under "indefinite" for H and Z: yet the highest frequency for depth, it will be remembered, came under "deep" or "moderately deep" for all these *O*'s, a fact which shows the difficulty of trying to correlate depth and definiteness. If we consider our total numbers, however, we find the highest frequencies coming under the rubrics "deep" and "indefinite."

The reports upon depth of the kinaesthetic image do not agree among the *O*'s. The highest frequency for B, Ca, Co, and H was "superficial;" for Z, "moderately deep;" for Su, "deep." Here no part of our scale for depth is favored by all *O*'s. B perceived some images as being outside the body, either just touching the skin or entirely separate from the body. Su reported 19 images which were so indefinite that she called them cases of "non-localization." They were unequivocal in reference; they *meant* that she was making the movement in imaginal terms, but they did not seem to be localized in the body.¹³

The images were most often definite in localization for Ca, Co, and H; indefinite for B; and moderately definite for Z. In the totals, we have our highest frequencies under "superficial"¹⁴ and "definite."

Our study of locality reveals a greater diversity among *O*'s than we found in our study of the attributive characters. This is to be expected, for here we are dealing with perception. The image, perhaps because it was a surface-like feel, was perceived by most *O*'s as being at or near the surface. Yet the highest frequency of report for quality came under the heading of dull pressure for B, Ca, and Co, three of the four *O*'s whose highest frequency of report upon locality was "superficial." Again, Su's highest frequency for quality came under the heading of light pressure, while the locality of her images was most often deep. Again, we might be tempted to suppose that the image was localized at or near the surface because it was perceived, generally speaking, as flat and thin, like the cutaneous qualities. And yet Su and Z reported a great many images which were perceived as "flat," but were localized as deep or moderately deep. We can only say, then, that although quality and bidimensionality are probably conditions of the perception of depth in the kinaesthetic image, there are other important conditions which our reports did not reveal.

¹³ There is an analogy to this indefiniteness of localization in the visual field. D. Katz characterizes the film-color as "indefinite" in localization; "Die Erscheinungsweisen der Farben und ihre Beeinflussung durch die individuelle Erfahrung," 1911, 73 ff.

¹⁴ Superficial does not always mean "on the surface;" it may mean "skin-deep" or "just underneath the skin."

(7) *Pattern*

TABLE VII

PATTERN

	B (2)		Ca (2)		Co (3)		H (3)		Su (3)		Z (3)		Total	
	S	I	S	I	S	I	S	I	S	I	S	I	S	I
Broad to narrow.....	8		3	3	1	2			14		2		28	5
Longer than broad.....	12		3	2	3	3	11		6		3		38	5
Spot to streak.....	2	15	3	2	21	19	8		6	23	18	7	58	66
Irreg. patch.....	3	3							12		7		22	3
Small spot.....				5	2	4		29	4	4	7	19	13	61
Qual. diff's.....			3		1				4		2		10	
Int. & viv. shadings.....	5	8	1		4	10			6	5	2		18	23
Total.....	30	26	13	12	32	38	19	29	52	32	41	26	187	163

Irreg. = Irregular; Qual. diff's = Qualitative differences; Int. & viv. shading = Intensive and vividness shading.

Su and Z reported also spots which became "rayed" on all sides, five times and once respectively; H reported a sharp, regular outline for the image 16 times; Z reported a "mosaic of spots" 7 times for sensation and twice for image (he could not decide whether it was qualitative or intensive.)

The totals in this table do not equal those in the former tables, because often there was no observable pattern in the kinaesthetic experience.

Kinaesthetic sensory complexes show great diversity of pattern. There were reported, by all observers but H, "masses" which ran out to points in pyramidal fashion; there were indefinitely outlined "patches," sometimes "bulky," sometimes "flat," and usually "longer than broad;" there were "spots or lumps" which stretched out to "bands" during their course; there were small spots which remained unchanged during their course, for all but B and Ca. Dimensionality did not come into all reports, but where it appeared, the kinaesthetic sensations are mostly tridimensional. The O's who did not report upon it were questioned at the end of the experiment, and stated that so far as they could remember most of their kinaesthetic sensations had been in three dimensions.

The qualities showed characteristic patterns. Strain was perceived as "stringy" or pointed; dull pressure as "massive" and "bulky," and often "elongated;" light pressure as "patchy," "sheet-like," or "flat." The patterns themselves had attributive differences within them: "nuclei" of dull pressure, strain, or smooth pressure, with "fringes" of light or bright pressure (for H and Z); "bands" of dull pressure with pointed ends of strain (for Ca, Co, and Su). Intensive and vivid variation, such as more intense or vivid center, point, or end, or "strips" or "cores" or "mosaics" of greater intensity or vividness, were reported by all.

The kinaesthetic images show more uniformity in pattern than the kinaesthetic sensations. Their pattern consisted almost entirely of small spots, which sometimes remained unchanged during their brief temporal course, and at other times ran out temporally to small streaks. Images, too, were bidimensional, or of very slight thickness.

For all O's the qualitative patterning of the images was uniform. For some O's (Ca and H) the images were uniform in all the attributes; for others there were at times intensive and vivid variations within the pattern: a less intense border which was perceived as

"fringed" if the quality was dull pressure; as "fuzzy," "feathery," or "like a bit of down, only smoother," if the quality was light pressure; a greater intensity or vividness at one end or side; or a wave of vividness which travelled over the image (for Ca and Su).

(8) Temporal Course

TABLE VIII
TEMPORAL COURSE

	B (4)		Ca (2)		Co (3)		H (4)		Su (3)		Z (3)		Total	
	S	I	S	I	S	I	S	I	S	I	S	I	S	I
Increase in intensity.....	22	20	29	7	24	15	80		29	3	39		223	45
Increase in extent.....	12	8	10	7	35	29	47		29	23	35	5	168	72
Increase in vividness.....	18	8	13	8	6	1	5		10	11	3		55	28
Decrease in intensity.....	31	17	18	2	2	2	14		8				71	21
Decrease in extent.....	6		5	2	2	2	3						16	
Decrease in vividness.....	28			2	3				4		11		46	2
Addition of quality.....	42		6		20		75		29		42		214	
Subtraction of quality.....	37		7		6		31		7		16		104	
No change.....		22		13			52		17		40		144	
Total.....	196	75	88	41	96	47	255	52	116	54	146	45	897	314

Kinaesthetic sensory complexes undergo attributive as well as processual changes in temporal course. All the *O*'s reported increases in intensity, extent, and vividness, while some reported decreases in intensity, extent, and vividness. Processual changes were reported by all. A perception of movement might begin, *e. g.*, with dull pressure, to which would be added strain, and perhaps ache. The ache might be very brief, leaving the strain and dull pressure. Then the strain would drop out, perhaps, leaving the dull pressure. Addition of quality was more frequent than subtraction of quality for all *O*'s except Ca.

Kinaesthetic images or imaginal complexes undergo very little attributive change and no processual change during their course. Oftentimes the image remained absolutely unchanged (for all *O*'s but Co). Increase in some one of the intensive attributes was common with B, Ca, Co, and Su; most often in intensity for B and Ca, most often in extent for Co and Su. All of H's images were without pattern or temporal course; only 5 of Z's images had temporal course. Decreases in the intensive attributes were rarely reported by anyone but B. No processual changes were reported. An image never adds to itself a new process. It simply flashes in and out, with now and then a second image following it, but entirely separate from it.

(9) 'Body' or Collocation of Attributes

Kinaesthetic sensations have more "body" than images. The intensive attributes in the sensory integrations are of varying degree. If a sensation is of very weak intensity, and of very limited extent, it will be, in all probability, somewhat long in duration. A haphazard search through reports on sensation shows the following combinations:

Observer	Intensity	Extent	Duration
Co	weak	very extended	long
	strong	mod. limited	long
H	weak	mod. limited	mod. long
	mod. strong	extended	short
Su	weak	extended	mod. short
	weak	mod. limited	long
Z	weak	mod. extended	mod. short
	moderate	extended	long

The majority of reports on image for these 4 observers show integrations of this sort:

Intensity	Extent	Duration
weak	limited	short
mod. weak	very limited	very short
very weak	very limited	very short

Although there were reports of sensations which were weak, limited, and short, there were never reports of sensations as very weak, very limited, very short. Yet all *O*'s gave many reports of images which were very weak, very limited, and very short.¹⁵

SUMMARY

Kinaesthetic sensation and kinaesthetic image compare thus:

(1) The qualities in kinaesthetic sensation are dull pressure, light pressure, bright pressure, smooth pressure, strain, and ache. The qualities in kinaesthetic image are all 'pressury,' dull pressure, light pressure, and possibly smooth pressure (cf. p. 73).

(2) The intensity of kinaesthetic sensation may be anywhere on the intensive scale from strong to weak. The intensity of the kinaesthetic image is always comparatively weak.

(3) Kinaesthetic sensations range all over the extensive scale from near zero to maximum, with a tendency however to group themselves about the upper part of the scale. The extent of the kinaesthetic image is for the most part limited, and it never reaches the maximum of extent attained by some sensations.

(4) The duration of kinaesthetic sensation is, in most cases, relatively long. The duration of the kinaesthetic image is

¹⁵ Cf. J. Lindworsky, "Wahrnehmung und Vorstellung," *Zeits. f. Psych.*, LXXX, 1918, 215 ff.; C. Stumpf, "Empfindung und Vorstellung *Abh. d. kgl. preuss. Akad. d. Wiss.*, 1918. These articles reached us, unfortunately, too late for more than a mention at this place. See also E. B. Titchener, *Thought-Processes*, 1909, 20 f., 214; and for evidence of 'holding' in the sphere of sensation, R. T. Holland, *Journ. Exp. Psych.*, iii., 1920, 312 ff.

relatively short; it never reaches the highest part of the durative scale.

(5) The vividness of kinaesthetic sensations ranges from high to low. The vividness of the kinaesthetic image, on the other hand, is always high, unless the image is accompanied by imagery from other sense-departments.

(6) The locality of kinaesthetic sensations ranges from deep and indefinite to superficial and definite, with a tendency to be deep and indefinite. Dull pressure and smooth pressure are deep; strain and ache, more superficial; and light pressure, superficial. Kinaesthetic images are localized definitely by most *O*'s on or near the surface. They show no correlation between quality and depth or definiteness.

(7) Kinaesthetic sensory complexes show various types of pattern: 'pointed' or 'stringy' for strain; 'bulky' and 'roundish' or 'elongated' for dull pressure; and 'flat' and 'patchy' for light pressure. There are qualitative differences and intensive and vivid shadings within the sensory pattern. The sensations are for the most part tridimensional. Kinaesthetic imagery shows always the same pattern, a small spot, which sometimes increases temporally to a streak. It is uniform in all attributes for some *O*'s; it has intensive shadings for others. The images are most often bidimensional.

(8) The kinaesthetic sensory complexes show attributive as well as processual changes in temporal course, increasing and decreasing in all the intensive attributes, and changing in quality by addition and subtraction. Kinaesthetic imagery has very little, if any, temporal course, being generally too brief for change. Cases in which the image undergoes a slight increase in extent or intensity are the only exceptions to this statement.

(9) Kinaesthetic sensations have more 'body' than kinaesthetic images. What the sensation lacks in any one intensive attribute it makes up for in some other intensive attribute; the image may be poor in all the intensive attributes save vividness.

II. RESIDENT AND PROJECTED KINAESTHETIC IMAGERY

We have now compared kinaesthetic memory-image with simple kinaesthetic perception, and have been able in this way to compare kinaesthetic sensation with the kinaesthetic simple image aroused under certain (*i.e.*, memory) conditions. We have, however, no reason to suppose that we have exhaustively described 'the' kinaesthetic simple image. Under other conditions of arousal, the image may show in other

phenomenal modes. In particular, there may (we thought) be various attributive differences between the resident kinaesthetic image of memory and the projected kinaesthetic image of empathy, if indeed we have any psychological right to speak of a 'projection' of kinaesthesia at all. This, then, is the point upon which our further experimentation is directed.

We made out a new list of paired commands for the arousal of kinaesthetic imagery, half of them representing situations which called for usual, ordinary, familiar movements, similar to those of the preceding experiments, the other half representing situations in which there were unusual movements.

The experimental procedure was the same as before. The instructions, too, were the same. The work began at the end of October, and continued throughout the next four months. Two of our *O*'s, Ca and St, left the university; the remaining five served in this second period of our work.

Experiment III

We performed about 50 preliminary experiments, in order that our *O*'s might attain a fair degree of stability of attitude. We found that now, when the situations were more complex, the visually minded *O*'s realized the situations for the most part in visual terms, in spite of the instructions. We decided, therefore, to change the wording of our commands, making them read, "Feel: Tantalus standing in water, trying in vain to drink," instead of "Think of: Tantalus standing in water, etc." We explained that by "feel" we meant "realize kinaesthetically." This slight change in the stimuli effected wonders in the results. Visual imagery became unimportant, while the kinaesthetic imagery, in many cases, carried the whole meaning of the situation.

Experiment IV

We were now ready to begin the main part of the experiment. We made out fifteen paired commands, one member of every pair referring to a usual situation, the other member referring to an unusual situation.¹⁶ Again we fractionated the characters to be reported upon, asking in Group I for quality, intensity, and extent; in Group II. for duration, vividness, and locality; in Group III. for pattern and temporal course. We repeated every group, so that we had 60 experiments for every group.

¹⁶ Examples of the stimuli are: "Feel: yourself running downstairs." "Feel: an acrobat walking a tight rope." "Feel: Laocoon struggling in the coils of the serpent." "Feel: yourself stooping to pick up a pencil." The colon after the word "feel" indicates that a short pause was made after this word in reading the stimuli.

Results

We found that the kinaesthetic images aroused by our stimuli may be classified under two main headings: (1) resident kinaesthesia, which is like that studied in the first part of the paper, the kinaesthetic imagery which ordinarily is referred to oneself; and (2) projected kinaesthesia, the kinaesthetic imagery which is projected outward, and is referred ordinarily to someone else or something else.

The *O*'s came upon the projection gradually. *H*, *e. g.*, said: "That kinaesthesia was not in me; it belonged to the visual image." "The kinaesthesia did not relate to myself; it related to someone else." And later (of an image aroused by the stimulus, "Feel: a farmerette pitching hay"), "The kinaesthetic image belongs to the farmerette, it is a kind of empathy."

Z, after reporting for some time the fact that some of his kinæsthetic images did not belong to himself, but to the person referred to in the stimulus, said: "It is a kind of projection."

Su reported at first thus: "The kinaesthetic image belonged to myself; then it was projected into an imaginary figure." And for another situation, relating to Tantalus trying in vain to drink: "The imagery was in me and then in Tantalus, but somehow it was transferred from the right side of my neck to the left side of Tantalus, who was out in front and facing me." Later, *Su* reported: "It seems as if the kinæsthesia is lifted bodily out of me and put into someone else; then it changes attributively. Sometimes, it sinks back into me at the end of the report." Still later *Su* reported projection without having first noted the beginning in resident kinaesthesia.

Co reported for the stimuli referring to the self: "The kinaesthetic image was in me," but for the stimuli referring to someone else: "The kinaesthetic image was not in me, but went with the visual image to make up the situation."¹⁷

Finally, *B* said of a projected kinaesthetic image: "It is as if it were fully formed out in space, and happened to catch my attention." And again: "It is fully formed like an object out there to be looked at."

Thus, all the *O*'s came, rather slowly but certainly, to a realization that some of their images were resident, while others were projected out into a foreign object.

We found, however, that before the resident and projected kinæsthesia could be differentiated clearly, we had to break up an attitude which some of the *O*'s had carried over from the work on sensation and image. There, it will be remembered, because of the mistakes of several *O*'s who "held" or "built up" their images, we had warned all the *O*'s against a shift from the passive or receptive attitude towards sensation to an active or constructive attitude toward their imagery. When their attention was thus called to the change, they realized that the images which were taken passively, as the sensations were, did not persist, but were sudden and brief. It was then natural to keep the passive attitude, and to be content to report upon the brief "flash" of kinaesthesia as it came and passed.

¹⁷ Two of the *O*'s always had visual accompaniments to their projected kinaesthesia; three had nothing but kinaesthetic imagery, the whole imaginal figure and the meaning of the situation being carried in terms of dull pressures, light pressures, bright pressures, strains and aches.

But here where we are working upon a differentiation within the realm of imagery itself, the *O's must be able to shift attitudes*. The projected kinaesthesia begins as a brief flash of resident kinaesthesia, which is then projected out into a foreign object, and becomes stabilized as the attitude shifts from passive to active. After an *O* has become habituated to the active attitude of projected kinaesthesia, the beginning bit of resident kinaesthesia may fail to be observed. Before such habituation, however, the resident kinaesthesia and the projected kinaesthesia may alternate, making the experience mixed. If, now, the *O* is accustomed to the passive attitude, he will seize upon the fleeting resident image, and will begin his report immediately after this 'flash' of experience, instead of waiting for 'stabilization.' He will thus report upon resident kinaesthesia partially changed, perhaps, by admixture of a bit of projected kinaesthesia.¹⁸

As soon as the *O's* became familiar with the two attitudes, we asked them to alternate the two. When we instructed them to take an active attitude toward the stimuli which normally gave resident kinaesthesia, they reported that the image could not be made to persist, but slipped away, repeated itself, and produced a quick succession of images of like patterns. This shows that true 'stabilization' was not possible. When we instructed the *O's* to take a passive attitude toward the stimuli which normally gave projected kinaesthesia, they reported different patterns with each succeeding 'flash' of experience, until in the end all the separate patterns returned, became stabilized, and persisted as a complete situational image. This shows that stability was necessary here for a complete realization of the experience. In these cases, neither the 'flash' nor the 'stabilization' was quite natural: the 'flash' was not the totally involuntary thing that normally occurs in resident kinaesthesia, and was longer in time; and the 'stabilization' was not complete as in projected kinaesthesia; there were gaps in time, in which there was no process. The *O's* thus discovered that, although either attitude is possible with any stimulus, the active attitude is natural for projected kinaesthesia, as the passive attitude is natural for resident kinaesthesia. They reported also that the active attitude seems to grow naturally out of the passive, as stability grows naturally out of a beginning 'flash.'¹⁹

From the statements of the *O's* in characterizing the two attitudes, we have gleaned the following differences between the two. The attitude in projected kinaesthesia is the perceptive attitude; the situation is objectified, and the *O* contemplates it as he would a landscape; the report upon the imagery is more like an *Aussage*-report than a scientific description; the attitude is correlated with imagery which is so full that it is not all clear at once, imagery which is persistent and unchanging as the different parts become vivid in turn for report; the attitude is active, exploratory, detached. The attitude in resident kinaesthesia is the sensory attitude, the same as that of the earlier part of our work; the *O* experiences the imagery as he would a sensation or an after-image; the report is the ordinary laboratory

¹⁸ The two terms 'flash' and 'stabilization' were used by an *O* in distinguishing the experiences under the two attitudes.

¹⁹ It may be that some of Perky's critics have been misled by failure to recognize the different attitudes. Their *O's* may not have waited for stability, but may have reported upon the first brief 'flash' of experience; and may then have called this an 'image of imagination,' when in reality it was a 'memory image' from which an 'image of imagination' might (with shift of attitude) have developed.

description; the attitude is correlated with imagery which is all clear at once, and is fleeting and changing; the attitude is passive, receptive, realizing.

A. RESIDENT AND PROJECTED KINESTHETIC IMAGERY COMPARED

The following tables, arranged upon the same plan as those for the comparison of sensation and image, show the difference in the psychological pictures of resident (R) and projected (P) kinaesthesia.

(1) *Quality*

TABLE IX

QUALITY

	B (2)		Co (2)		H (2)		Su (2)		Z (2)		Total	
	P	R	P	R	P	R	P	R	P	R	P	R
Du. P.	30	29	30	26	85	1	22	9	41	18	208	83
Brt. P.	11				34		18		1		64	
Drag.					2				2		4	
Sm. P.					13		5		1		19	
Strain.	2		16		45		3		10		76	
Ache.	1		4		21		2		6		34	
Lt. P.	1	26	4	7	16	43	32	26	11	66	119	
Total.	45	55	54	33	216	44	82	41	87	29	471	202

P = projected kinaesthetic imagery; R = resident kinaesthetic imagery.

Du. P. = Dull Pressure; Brt. P. = Bright Pressure; Sm. P. = Smooth Pressure;.

Lt. P. = Light Pressure (or Neutral Pressure.)

Projected kinaesthetic imagery is qualitatively very much like sensory kinaesthesia. Dull pressure, strain, ache, and light pressure are common. Bright pressure occurs much more often in the projected imagery than in the sensory complexes; only one *O* failed to report it here, while only two *O*'s found it in actual sensations.²⁰ The existence of smooth pressure in projected kinaesthesia is doubtful; only three *O*'s reported it, and that in a comparatively small number of cases. Drag is not common in projected kinaesthesia.

From 4 to 7 different qualities were reported in projected kinaesthetic imagery. Dull pressure has the highest frequency in the average, and for the individual *O*'s with the exception of Su.

Resident kinaesthetic imagery has but two qualities, dull pressure and light pressure. In the preceding part of our work we were in doubt whether to include smooth pressure in the list of qualities for

²⁰ A 'textural' difference is reported between the bright pressure of sensation and the bright pressure of projected kinaesthesia. In sensation, it is 'sparkling' like a liquid upon which a light is shining; in projected imagery, it is misty, like a halo or a sun-lighted cloud.

imagery. Since none of the *O*'s, after further training, reported it, we may conclude that it is not characteristic of resident kinaesthetic imagery (cf. p. 59). Light pressure has the highest frequency in the average, although individual *O*'s gave the highest frequency to dull pressure.

Here, where our situations are more complex, a single image-process did not always stand for the whole situation. Often the reports showed an imaginal complex made up of a number of simple processes following one another in quick succession, and differing from one another very slightly. There were never two such processes present at once, as there were in the projected kinaesthesia and in sensory kinaesthesia.

(2) *Intensity*

TABLE X

INTENSITY

	B (2)		Co (2)		H (2)		Su (2)		Z (2)		Total	
	P	R	P	R	P	R	P	R	P	R	P	R
Strong.....	14		17		33		8				72	
M. St.....					23		5				33	
Mod.....	5	19	25	12	33		21	3	32	16	116	50
M. Wk.....	5	7			5	2	11	12	37	15	58	36
Weak.....	10	16	8	17	26	29	27	11	17	3	88	76
V. Wk.....	8	13	4	4	14	10	14	14	5		45	41
Total.....	42	55	54	33	134	41	86	40	96	44	412	203

M. St. = Moderately Strong; Mod. = Moderate; M. Wk. = Moderately Weak; V. Wk. = Very Weak.

The intensity of projected kinaesthetic imagery ranges from strong to weak, with the highest frequency of the average coming under 'moderate' as in the sensory complexes. The highest frequency for B falls under the rubric 'strong;' for Co, under 'moderate;' for Su, under 'moderately weak.'

The intensity of resident kinaesthetic imagery ranges from moderate to very weak, with the highest frequency averaging 'weak.' The highest frequency for B and Z occurs under 'moderate;' for Co and H, under 'weak;' for Su, under 'very weak.'²¹

²¹ We see that the *O*'s have ceased to report any resident kinaesthetic images in the upper half of the intensive scale (cf. p. 60). Training undoubtedly had an effect here; but there is a more important factor to be considered, namely, the fact that the *O*'s had no absolute criterion. It was natural, then, that the resident imagery should be comparatively weaker when compared with projected kinaesthesia, which represented large and complicated movements, than it was when compared with simple sensory movements, such as we used for stimuli in the earlier experiments.

(3) *Extent*TABLE XI
EXTENT

	B (2)		Co (2)		H (2)		Su (2)		Z (2)		Total	
	P	R	P	R	P	R	P	R	P	R	P	R
V. Ex.....	2				33		6				41	
Ext.....	3		7		22		14		1		47	
M. Ex.....	20				29		25		3		77	
Mod.....	2	16	31	7			11	3	39	6	83	32
M. Lm.....	4	11			13		12	7	33	11	62	29
Lim.....	5	10	16	30	6	9	15	16	12	12	54	77
V. Lm.....	6	16	1		4	21	3	14	10	5	24	56
Total.....	42	53	55	37	107	30	86	40	98	34	388	194

V. Ex. = Very Extended; Ext. = Extended; M. Ex. = Moderately Extended; Mod. = Moderate; M. Lm. = Moderately Limited; Lim. = Limited; V. Lm. = Very Limited.

Projected kinaesthesia, like sensory kinaesthesia, varies in extent from very extended to very limited. The highest frequency comes under the heading 'moderately extended' for B and Su; under the rubric 'moderate' for Co and Z; under the rubric 'very extended' for H.

According to the table, the resident kinaesthetic image never goes beyond the middle part of the extensive scale.²²

The highest frequency of report is 'limited' for Co, Su, and Z; and 'very limited' for H. The highest frequency in the totals comes under the heading 'moderate' for projected kinaesthetic imagery; the highest frequency in the totals comes under the heading 'limited' for resident kinaesthesia. Thus all the resident images are found in the lower half of the scale, while over 50 per cent of the projected images are found in the upper half of the scale of extent.

(4) *Duration*TABLE XII
DURATION

	B (2)		Co (2)		H (2)		Su (2)		Z (2)		Total	
	P	R	P	R	P	R	P	R	P	R	P	R
Long.....	32		48		175		92		117		420	
M. Lg.....												
Mod.....				1								1
M. Sh.....		13		4			8		6			28
Short.....		6		24		1	11		5			42
V. Sh.....		17		9		49	14		19			99
Total.....	32	36	48	38	175	50	92	33	117	30	420	170

M. Lg. = Moderately Long; Mod. = Moderate; M. Sh. = Moderately Short; V. Sh. = Very Short.

²² Training *plus* a larger relative scale for comparison has again levelled out the discrepancies which we found in the earlier reports (cf. p. 61).

Projected kinaesthetic images are always long in duration. The whole image comes fully formed, and there is no addition or subtraction of process.

Resident kinaesthetic images are always short in duration. The highest frequency for all O's falls under the rubrics 'short' and 'very short.' The highest frequency in the totals comes under the rubric 'very short.'²³

(5) *Vividness*

TABLE XIII

VIVIDNESS

	B (2)		Co (2)		H (2)		Su (2)		Z (2)		Total	
	P	R	P	R	P	R	P	R	P	R	P	R
V. H.	6	4	1	7	20	43	2	4	1	15	30	73
High.	9	9	19	14	56	6	25	16	2	10	111	55
M. H.	13	19	12	11	7		33	8	20	3	85	41
Mod.	5	5	8	1	6		19	5	33	2	71	13
M. Low.	2				30				30		62	
Low.			6	1	60		13		33		112	1
Total.	35	37	46	34	179	49	92	33	119	30	471	183

V. H. = Very High; M. H. = Moderately High; Mod. = Moderate; M. Low = Moderately Low.

The vividness of projected kinaesthesia is divided evenly between high and low. Not all of the projected experience can be in the focus of attention at one time. The highest frequency of report falls under the heading 'moderately high' for B and Su; under 'high' for Co; and under 'low' for H.

The vividness of resident kinaesthesia ranges from very high to moderate. Most of B's images were 'moderately high;' most of Co's and Su's were 'high;' most of H's and Z's were 'very high.' The greatest number of images in the total falls under the heading 'very high.'

²³ The table for duration shows markedly the relativity of the subjective scale. In the earlier experiments, most of the images were 'short' in duration, but here by far the greatest number of images are 'very short' in duration (cf. p. 62). We can account for the change in report by the fact that the projected imagery is (objectively) very long in duration.

(6) *Locality*

TABLE XIV

LOCALITY

	B (2)		Co (2)		H (2)		Su (2)		Z (2)		Total	
	P	R	P	R	P	R	P	R	P	R	P	R
Deep.....	17	10	13		85		21	8	37	1	173	19
M. Deep.....	8	9	31		53		16	4	56	3	164	16
M. Sup.....	3	3	1	15	38	5	21	6	18	10	81	39
Sup.....	7	8	2	19		44	32	5	9	16	50	92
Total.....	35	30	47	34	176	49	90	23	120	30	468	166
Def.....	8	23	9	29	65	46	23	5	3	19	108	122
M. Def.....	10	8	21	4	41	6	24	7	41	9	137	34
M. Ind.....		1			23		4	11	38	1	65	13
Indef.....	15	3	18	1	49		39		38	1	159	5
Total.....	33	35	48	34	178	52	90	23	120	30	469	174

M. Deep = Moderately Deep; M. Sup. = Moderately Superficial; Sup. = Superficial; Def. = Definite; M. Def. = Moderately Definite; M. Indef. = Moderately Indefinite; Indef. = Indefinite.

B reported 2 sensations and 5 images localised "outside;" Su reported 9 images as 'not localised.'

Generally speaking, projected imaginal kinaesthesia, like sensory kinaesthesia, is localized as deep and indefinite. There is, however, much individual variation. As to depth, the highest frequency for B and H is under the rubric 'deep,' for Co and Z, under 'moderately deep;' for Su, under 'superficial.' As to definiteness, the highest frequency for B and Su comes under the rubric 'indefinite;' for Co and Z, under 'moderately definite;' for H, under 'definite.'

Resident kinaesthetic images are most often localized as superficial and definite. Most of Co's, H's, and Z's images were 'superficial' and 'definite;' most of B's were 'deep' and 'definite;' most of Su's were 'deep' and 'moderately indefinite.'

We find very few images in resident kinaesthesia which are indefinite in locality, although earlier (p. 63) we had a fair proportion of images reported under this rubric. We know of no way to account for the change except by the effect of training. One O said of resident kinaesthetic images: "They are so definitely localized that I could pin a ribbon on them."

We find, as before, cases of non-localization of resident images.

(7) *Pattern*

The pattern of projected kinaesthesia is even more varied than that of sensory kinaesthesia. All O's reported 'long strips' of bright pressure or dull pressure; 'strings' of strain; masses, longer than broad, of dull pressure; irregular patches of light pressure or bright pressure; small spots of dull pressure or light pressure. The bright pressure was sometimes characterized as 'hollow,' like a short tube

TABLE XV

PATTERN

	B (2)		Co (2)		H (2)		Su (2)		Z (2)		Total	
	P	R	P	R	P	R	P	R	P	R	P	R
Strip.....	5	12	3	24	7		4	16	24	16	43	68
Longer than broad.....	27		18		92		31	6			168	6
Irreg. Patch.....	3		5		5		43		10		66	
Spot.....		9		7	50	52	28	16	51	11	129	95
Qual. diff's.....			13		104						117	
Int. and Viv. shadings...	4	11	22	16	121		49	16	96	7	292	50
Def. outline.....				4		52	9				9	56
Indef. outline.....	1		14				6				21	
Total.....	40	32	75	51	379	104	170	54	181	34	845	275

Irreg. patch = Irregular patch; Qual. Diff's = Qualitative differences; Int. and Viv. shadings = Intensive and vivid shadings; Def. outline = Definite outline; Indef outline = Indefinite outline.

The following were also reported: "hollow pattern" for Projected Kinaesthesia, 10 (Su), 1 (B); "mosaic of spots" for Projected Kinaesthesia, 20 (Z).

or 'band-box.' This is a pattern which did not occur in sensory kinaesthesia. As in sensory kinaesthesia, so in projected kinaesthesia there were qualitative differences within the patterns, as well as intensive and vivid shadings, characterized as 'striped,' 'mosaics,' 'wrinkled,' 'spotted,' or 'fringed.' The projected patterns were often very indefinite in outline. They were both tridimensional and bi-dimensional. It is noteworthy that the frequency of report under every heading is much larger for the projected kinaesthesia than it was for the sensory kinaesthesia (p. 65). It is obvious that this difference is to be explained by the fact that the patterns in projected kinaesthesia persist unchanged while the *O* explores them, whereas the patterns in sensory kinaesthesia are in constant flux, and must be caught 'on the wing' for report.

The resident kinaesthetic images, like the kinaesthetic images of the earlier experiments, are characterized generally as small spots, which sometimes remain unchanged and at other times run out temporarily to streaks. Again we had no qualitative differences reported, but quite often intensive and vivid differences, such as "fringes" or "fuzzy" borders. As opposed to the projected kinaesthesia, the resident kinaesthesia is definitely outlined and, for the most part, bi-dimensional.

(8) Temporal Course

Projected kinaesthetic imagery shows no change in time. The imagined situation, made up entirely of kinaesthetic imagery, or supplemented by visual imagery, remains fully formed out in space, like an object at which we are looking, so that the *O* reports from the actual (imaginal) perception.

Resident kinaesthetic imagery comes more suddenly than projected imagery, and remains only a brief time, a time too brief to allow of any change for some *O*'s, but long enough for others to permit a slight increase in intensity or extent. The resident kinaesthetic images pass so quickly that the *O* must report them from memory.

SUMMARY

Projected and resident kinaesthetic imagery compare thus:

(1) The qualities in projected kinaesthesia are dull pressure, light pressure, bright pressure, strain, and ache. The qualities in resident kinaesthetic imagery are dull pressure and light pressure.

(2) The intensity of projected kinaesthesia ranges from strong to weak. The intensity of resident kinaesthesia ranges from moderate to weak.

(3) The extent of projected kinaesthesia ranges from maximum to near zero. The extent of resident kinaesthesia ranges from moderate to near zero.

(4) The duration of projected kinaesthesia is always long. The duration of resident kinaesthesia is always short.

(5) The vividness of projected kinaesthesia ranges from high to low. The vividness of resident kinaesthesia ranges from very high to moderate.

(6) The locality of projected kinaesthesia varies from deep and indefinite to superficial and definite, with a tendency toward depth and indefiniteness. The locality of resident kinaesthesia tends to be superficial and definite.

(7) Projected kinaesthesia shows various types of pattern: 'strips,' 'masses,' 'patches' and 'spots.' These patterns have qualitative differences and shadings of intensity and vividness. Both two and three dimensions are common. The resident kinaesthesia is unvaried in pattern, being ordinarily a spot which may run out temporally to a streak. It sometimes has slight shadings of intensity or vividness. It is most often bidimensional.

(8) Projected kinaesthesia shows no change throughout its long temporal course. Resident kinaesthesia may show slight attributive changes during its brief temporal course; it never shows processual changes.²⁴

B. Some Conditions of Resident and Projected Kinaesthetic Imagery

In the foregoing experiment, we obtained resident kinaesthetic imagery when the stimuli represented ordinary situations, such as stooping to pick up a pencil. But these stimuli always referred to the self: "Feel: yourself stooping to pick up a pencil." Further, we obtained projected kinaesthetic imagery when the stimuli represented unusual situations and movements not likely to have been made by the O's, such as walking a tight rope. But these stimuli referred always to someone else: "Feel: an acrobat walking a tight rope."

²⁴ Cutaneous projections, which are usually referred to association, as when we say a thing looks cold or hard, may very well be, in the light of these results, projections at the level of perception. But we know hardly anything of cutaneous imagery.

We asked ourselves, then, which is the stronger influence upon resident and projected kinaesthesia, the influence of the usual and unusual, or the influence of the self and another? The natural thing to do was to reverse the situations, so that the usual should refer to another person, the unusual to oneself. We made out new paired commands which fulfilled this requirement.

We found that one of three things happened. (1) As a rule, the *O*'s reported resident kinaesthesia with the stimuli referring to the self, and projected kinaesthesia with the stimuli referring to the other person, in spite of the usualness or unusualness of the situation. (2) Sometimes the report was mixed, resident kinaesthetic imagery occurring for part and projected for part of the same situation. This mixture occurred with stimuli referring to the self making some strange movement. The thought of the movement would begin in resident kinaesthetic imagery, but the imagery would quite suddenly project itself without changing the meaning in any way except to make the self-reference uncertain. The *O* would say: "I think that was myself in the projected imagery, but I am not at all sure; it was a detached self." Every *O* who experienced this projected kinaesthesia in the midst of resident said: "I wonder if the projection happened there because I have never performed such a movement." Thus H, under the instruction "Feel: yourself making a hundred yard leap on a pair of skis," experienced the beginning of the leap in resident kinaesthesia, the movement through the air in projected kinaesthesia, and the landing in resident imagery. He said: "I have never leaped on a pair of skis, but I have made leaps, and that may be the reason that I had resident for the beginning and end of the leap." (3) Sometimes pure projected kinaesthesia resulted when the stimulus referred to the self performing a very strange feat.

We now had the reversal from resident to projected kinaesthesia for certain situations referring to the self in a strange situation; but we had not the corresponding reversal from projected to resident for usual situations referring to someone else. We thought that the failure to obtain the second reversal might be due to the fact that our stimuli for these experiments did not equal in familiarity the strangeness of the stimuli for the first reversal; i. e., the *O*'s were *shocked* into projection by the strangeness of the one, and they must be *shocked* into resident imagery by the familiarity of the other. We therefore changed our situations, making them refer to someone else figuring in situations in which we had seen our *O*'s figure only a few days before. Immediately, and to the immense surprise of the *O*'s themselves, who had come to expect projection for all situations referring to other persons, resident kinaesthesia resulted.

We found, then, that the *O*'s could be shocked into projection in spite of the self-determination, and could be shocked into resident kinaesthesia in spite of the other-determination. The conditions thus cut across each other; ordinary usualness-unusualness is less strong a determinant than selfness-otherness, but a salient familiarity-strangeness, coming to the *O* with a shock of surprise, may reverse the normal conditioning of the two modes of imagery. It is plain that we are here upon the threshold of a highly complex problem, whose resolution will require methods more refined than those which we had at our disposal in the present study.

CONCLUSION

(1) Kinaesthetic images of memory may be distinguished from kinaesthetic sensations by uniformity, simplicity, and lack of 'body.' Kinaesthetic memory-images are uniform: always tiny bits of pressure, absolutely lacking in brightness. They are simple: they approximate single processes, and take on few or no perceptive characters. They lack 'body:' they are low in all the intensive attributes save vividness. Kinaesthetic sensations in a perception of movement are varied, complex, and have 'body;' they are now of one quality, now of another; they are sometimes high in all intensive attributes, sometimes high in only one, but always have more 'body' than the image; they constitute a sensory complex rich in all the perceptive characters.

(2) Kinaesthetic imagery may be classified under two main headings, resident and projected. The resident kinaesthetic images are referred ordinarily to oneself; the projected kinaesthetic images are referred ordinarily to someone else or something else. Resident kinaesthetic images may approximate simple processes, co-ordinate with sensation; projected kinaesthetic images constitute imaginal complexes, co-ordinate with perception. Resident kinaesthetic images show a psychological picture very different from the picture of kinaesthetic sensations in sensory complexes; projected kinaesthetic images in an imaginal complex show a psychological picture very like the picture of kinaesthetic sensations in a sensory complex. Resident kinaesthetic images are changing, fleeting, and involve an attitude which is passive, receptive, realizing; projected kinaesthetic images are invariable and persistent, and involve an attitude which is active, exploratory, detached, scrutinising.

(3) The difference between resident and projected kinaesthesia does not reflect merely the functional distinction of self and other; it is correlated with a specific difference of attitude on the part of the observer.